SCIENTIFIC NOTE

Update on the establishment of birch leafminer parasitoids in western Canada

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Five species of birch (*Betula*) leaf-mining sawfly have been introduced to Canada. The two most damaging species, *Profenusa thomsoni* (Konow) and *Fenusa pumila* Leach (previously known as *F. pusilla*), have wide distributions in western Canada (Digweed *et al.* 2009) and can be significant pests of birch in the region. The larvae of both species feed inside the leaf and cause brown blotch-shaped mines that are characteristic for each species. When outbreaks of these species occur, the large numbers of larvae create multiple mines within individual leaves. This damage causes trees to take on a burnt appearance, which is often considered undesirable in urban settings where birch is a popular ornamental tree. Over the last 20 years, we have studied the distribution and impact of these birch leaf-mining sawflies and their biological control using parasitoids in the Ichneumonid genus *Lathrolestes* Foerster (Digweed *et al.* 2009, MacQuarrie *et al.* 2013).

In Canada, outbreaks of *F. pumila* and *P. thomsoni* have been controlled by the introduction and redistribution of two species of *Lathrolestes* that attack the larvae as they feed within the leaf (Quednau 1984, Langor *et al.* 2002, Digweed *et al.* 2003, MacQuarrie *et al.*, 2013). Outbreaks of both sawfly species have been noted in western Canada, but since the 1990s *P. thomsoni* has been responsible for most of the observed damage. The sawfly is controlled by *Lathrolestes thomsoni* Reshchikov (previously known as *L. luteolator*), an endoparasitoid that was first observed attacking *P. thomsoni* during the late 1990s in Edmonton, Alberta (Digweed *et al.* 2003). In the early 2000s, other populations of the parasitoid were found attacking the sawfly in Hay River and Fort Smith, Northwest Territories, as well as in Edson, Alberta (MacQuarrie 2008). These parasitoid populations were later exploited for a biological control project against an outbreak of *P. thomsoni* in Alaska. This project successfully established *L. thomsoni* in at least one site in the state (MacQuarrie 2008, Soper 2012), and demonstrated that relocating free-living adult *L. thomsoni* is a feasible way to establish the parasitoid within an outbreak population of *P. thomsoni*.

In the early 2000s, outbreaks of *P. thomsoni* were reported in the Northwest Territories and northern British Columbia. To help suppress these populations, we collected adult *L. thomsoni* from Edson, Edmonton, Hay River and Fort Smith, and released them in Prince George, British Columbia, and Yellowknife, Northwest Territories (MacQuarrie 2008). We surveyed these populations in 2012 to determine: 1) if *L. thomsoni* had established; and, 2) how abundant it was. A survey in 2003 found that *P. thomsoni* was also present throughout much of the southern Yukon but not at outbreak levels (Digweed and Langor 2004). Therefore, we also surveyed in the Yukon to determine if *P. thomsoni* had changed in abundance and if *L. thomsoni* was present.

In the summer of 2012, we surveyed for *L. thomsoni* in Prince George, Yellowknife and Whitehorse, Yukon, using traps (7.5 cm x 12.5 cm yellow sticky cards; Contech Inc., Victoria, BC) set out at two or three sites in each city. In both Prince George and Yellowknife, one site was situated near the original release site and another site was established elsewhere. The two Prince George sites were located in a wooded area and in the yard of a private home, and were approximately 1.1 km apart. The two Yellowknife sites were both located in the

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yards of private homes and were approximately 2.5 km apart. In Whitehorse, the sites were located in wooded areas near a major road (two sites) and along a walking trail (one site). These sites were approximately 0.5–3.0 km apart.

At each site, three birch trees were selected by local volunteers, and a trap was hung at head height (approx. 2 m) in each tree. Traps were placed in early or mid-June, depending on the advancement of the season, and replaced weekly until early or mid-July, depending on the duration of *P. thomsoni* adult flight (Table 1). This study was intended for detection and not for population assessment. Volunteers were therefore allowed to carry out surveys according to their own local conditions rather than according to a prescribed method. This meant the number of traps hung in each city and at each site varied depending on how frequently the traps were changed. We report the total number of traps hung at each site over the trapping period (Table 1). The volunteers returned the traps at the end of the season, at which time we examined the traps' contents. Identification of all material on the traps was done by one of the authors (D. J. Williams).

We found *L. thomsoni* to be established in Prince George, and established and abundant in Yellowknife (Table 1). Populations of the sawfly at both release sites appear to be large relative to the size of the parasitoid populations. Parasitism rates (percent of the total catch that was adult parasitoids) ranged from 11–17% in Yellowknife and 6–8% in Prince George. In contrast, the *P. thomsoni* population in Whitehorse appeared to be small, and a parasitoid population was not detected (Table 1).

Our survey indicates *L. thomsoni* has established in Prince George and Yellowknife. Suppression of either population was not tested, but anecdotal evidence suggests that damage by *P. thomsoni* has been less evident in recent years (MacQuarrie *et al.* 2013). However, even when populations are large, the appearance of damage caused by *P. thomsoni* can vary from year to year (MacQuarrie 2008), and a decrease in visible damage may not indicate a sawfly population

Table 1

Summary of trap catches for adult *Profenusa thomsoni* (Konow) and adult *Lathrolestes thomsoni* Reshchikov for three cities in 2012.

Trapping period	Days	Site	Total traps	*P. thomsoni*		*L. thomsoni*	
				Percent positive traps (n)	Total adults	Percent positive traps (n)	Total adults
Prince George, British Columbia							
21 June– 4 July	13	1	20	60% (12)	82	15% (3)	7
		2	20	75% (15)	63	20% (4)	4
Whitehorse, Yukon							
8 June– 17 July	39	1	15	13% (2)	3	0% (0)	0
		2	15	0% (0)	0	0% (0)	0
		3	15	13% (2)	3	0% (0)	0
Yellowknife, Northwest Territories							
4 June– 16 July	42	1	14	71% (10)	1931	57% (8)	236
		2	24	54% (13)	862	38% (9)	177

experiencing suppression by the parasitoid. Repeated observations of both populations, including an assessment of parasitism rates, would be necessary to confirm if *L. thomsoni* is controlling *P. thomsoni*.

The population of *P. thomsoni* in Whitehorse is small, and *L. thomsoni* does not appear to be present. We suggest that Whitehorse be monitored at regular intervals to assess the status of the *P. thomsoni* population. Should an outbreak occur, the established *L. thomsoni* populations in Yellowknife and Prince George could serve as sources of parasitoids for release in Whitehorse.

Determining the true impact of *L. thomsoni* on the dynamics of the Prince George and Yellowknife *P. thomsoni* populations requires collecting and rearing large numbers of leafminers to obtain an estimate of the percent parasitism. Such estimates have been done for other *P. thomsoni* populations, but the work requires significant time, effort, and financial resources to make an accurate assessment (MacQuarrie 2008). These resources are hard to obtain for species, like *P. thomsoni*, that are considered minor, aesthetic pests. In contrast, sampling adult parasitoids, while a less precise estimate than rearing, is a simple and inexpensive way to determine the presence and relative abundance of a parasitoid.

We are optimistic that control of the sawfly will be achieved at Prince George and Yellowknife, based on the observation that *L. thomsoni* has persisted at both sites for at least five years without any assistance or augmentation. This suggests that the *L. thomsoni* populations at these sites are resilient and should be able to maintain their presence into the future.

ACKNOWLEDGEMENTS

We thank S. Lindgren, University of Northern British Columbia, Prince George; S. Carriere and D. Taylor, Government of the Northwest Territories, Yellowknife; and B. Godin, Environment Canada, Whitehorse, for their assistance in placing and monitoring sticky traps; and R. Johns and three anonymous reviewers for their comments on an earlier version of this manuscript.

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